

## Bibliographic Fields

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## Technical

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(54) [Title of Invention]

**ELECTROSTATIC IMAGING TONER AND IMAGE FORMATION METHOD**

(51) [International Patent Classification, 7th Edition]

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Ikeura Toshiaki

(57) [Abstract]

[Problems to be Solved by the Invention]

While maintaining low temperature fixing behavior , there is not an abolition job of the residual toner , when adopting useful [kuriinaresu ] image formation method for environmental contamination prevention , it evades the residual image phenomenon which it occurs, offer toner for electrostatic charge image which at sametime can assure cost reduction and

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image formation method which uses this toner .

**[Means to Solve the Problems]**

At least, when melting said toner in tetrahydrofuran in electrostatic imaging toner which consists of smaller additive particle than coloration particle and said coloration particle which consist of resin and coloring, peak value (Mp) in weight fraction fabric of dissolved fraction 7000 or less, At same time toner which possesses transfer step which copies the developing step and toner image which latent image image developing are done on support electrostatic imaging toner which designates that content below molecular weight 539 is 3.0 weight % or less as feature and making use of latent image formation step. toner which at least forms latent image in latent image grip surface, after copying remains on latent image grip aspect, When latent image image developing is done with developing step, regarding to the image formation method which recovers simultaneously inside developing device, image formation method. which designates that it uses above-mentioned electrostatic imaging toner as feature

**[Claim(s)]**

**[Claim 1]**

At least when melting said toner in tetrahydrofuran in electrostatic imaging toner which consists of smaller additive particle than coloration particle and said coloration particle which consist of resin and coloring, peak value (Mp) in weight fraction fabric of dissolved fraction 7000 or less, electrostatic imaging toner, which designates that at same time content below molecular weight 539 is 3.0 weight % or less as feature

[Claim 2]

addition quantity of said additive particle, electrostatic  
imaging toner. which is stated in Claim 1 which is 0.8 parts by  
weight or more vis-a-vis toner 100parts by weight

**[Claim 3]**

At least, when it possesses transfer step which copies developing step and the toner image which latent image image developing are done on support, making use of latent image formation step. toner which forms latent image in latent image grip surface, after copying toner which remains on latent image grip aspect, image developing it does latent image with developing step regarding to image formation method which recovers simultaneously inside developing device, image formation method. which designates that electrostatic imaging toner which is stated in Claim 1 or 2 is used as feature

## Specification

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[Description of the Invention]

[0001]

[Technological Field of Invention]

this invention regards electrostatic imaging toner and image formation method, furthermore as for details, without using device which remains toner after copying the cleaning is done image recording line it is something regarding image formation method which uses electrostatic imaging toner and this toner which can do thing.

[0002]

[Prior Art]

predetermined latent image is formed, on photoreceptor drum or other latent image grip such as electrophotography equipment and electrostatic recording device, making use of toner as for image formation device which imaging is done, toner image which was formed on latent image grip cleaning unit in order usually, to remove the residual toner on latent image grip from fact that always 100% it cannot copy on paper or other support, has.

[0003]

As cleaning unit, elastic rubber blade is pressed to latent image grip surface, blade cleaning unit which removes remains toner in mechanical and, high speed rotation doing brush roller which plants thin fiber, depositing, brush cleaning unit which removes there remains toner has been known toner in hair end of brush.

[0004]

But, there is a or other problem which is possibility where from fact that the work of abolishing residual toner which compilation is done occurs inside the cleaning unit, still abolishes useable residual toner, printing cost of per disk rises relatively, when abolishing causes pollution of device periphery and the environment.

In order to evade these, residual toner which compilation is done is reset to developing part into cleaning unit, but there is also a method which is reused equipment cost rises from fact that it is necessary to transport the toner making use of pipe, causes toner deterioration or other problem in midst of decreasing and pipe of degrees of freedom in regard to the device design.

In addition, when blade cleaning unit is used, photoreceptor drum wearing by friction with cleaning blade, there are also times when decrease of image formation characteristic and lifetime occurs.

[0005]

In order to solve problem a this way, after copying remains toner on photoreceptor drum or other latent image grip , without using cleaning unit with developing device simultaneously with development image formation method (Below [kuriinaresu ] image formation method you call ) which recovers inside the developing device , has been proposed residual toner with for example Japan Unexamined Patent Publication Showa 59-133573disclosure , Japan Unexamined Patent Publication Showa 59-157661disclosure etc.

[0006]

On one hand, as toner which is used for [kuriinaresu] image formation method, in the Japan Unexamined Patent Publication Hei 5-2287disclosure, in order to prevent residual image with remains toner charge in the electrical resistance of preferred toner and toner, Japan Unexamined Patent Publication Hei 5-188637disclosure which stipulates amount of charging, in the toner, Japan Unexamined Patent Publication Hei 9-288373disclosure which stipulates preferred particle diameter distribution and shape, amount of charging in order both achievements todo image density and cleaning behavior, Decreasing copying remaining toner, in toner, Japan Unexamined Patent Publication Hei 10-20539disclosure which stipulates shape and additive in order to offer preferred toner with [kuriinaresu] image formation method, specific additive and spherical shape toner which stipulates coating ratio aredisclosed for image stabilization.

[0007]

Request has increased concerning toner which recently, from the consideration for environment, simultaneously with device which can decrease waste like [kuriinaresu] image formation method, energy consumption is little, becomes fixed with low temperature.

Then, as for inventors , when evaluation it does printing characteristic in [kuriinaresu ] image formation method making use of low temperature fixing toner , it understood that residual image whichparallels to image pattern is easy to occur.

This, with device which possesses cleaning unit, with [kuriinaresu] image formation method, the compilation makes also filming substance which originates in extremely little toner, gradually on photosensitive material vis-a-vis being able to remove various substance with rubber blade and brush roller, being problem that textural contamination which parallels to image pattern occurs, was ascertained.

[0008]

**[Problems to be Solved by the Invention]**

**While this invention cancelling conventional problem a this**

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way, maintaining the low temperature fixing behavior, there is not an abolition job of residual toner, when adopting the useful [kuriinaresu] image formation method for environmental contamination prevention, it evades residual image phenomenon which it occurs, At same time toner for electrostatic charge image which can assure cost reduction (Below, there is toner simply.) and it is something which designates that image formation method which uses the this toner is offered as problem.

[0009]

[Means to Solve the Problems]

these inventors, in order to solve above-mentioned problem, dissolution characteristic of toner paying attention to resin which is used, completing result and this invention which repeat diligent investigation reached point of.

[0010]

According to namely, this invention, when in first, melting said toner in the tetrahydrofuran in electrostatic imaging toner which consists of smaller additive particle than coloration particle and said coloration particle which at least consist of the resin and coloring, peak value (Mp) in weight fraction fabric of dissolved fraction 7000 orless, At same time electrostatic imaging toner which designates that content below the molecular weight 539 is 3.0 weight % or less as feature is offered.

[0011]

addition quantity of said additive particle, electrostatic imaging toner which is 0.8 parts by weight or more vis-a-vis the toner 100 parts by weight, is included in this first invention.

[0012]

According to this invention, when in second, it possesses transfer step which copies developing step and toner image which latent image image developing are done on support making use of latent image formation step. toner which at least forms the latent image in latent image grip surface, after copying toner which remains on latent image grip aspect, image developing it does latent image with developing step, regarding to the image formation method which recovers simultaneously inside developing device, image formation method which designates that electrostatic imaging toner of first invention is used as feature is offered.

[0013]

[Embodiment of the Invention]

As for means which obtains low temperature fixing possible toner it is several, but it is most effective to make molecular weight distribution of resin which the configuration is done

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small.

When one index, melting toner in tetrahydrofuran (THF), with peak value (Mp) in weight fraction fabric of dissolved fraction, 7000 or less is desirable, 5500 or less furthermore is desirable.

[0014]

However, regarding to [kuriinaresu] image formation method which uses low temperature fixing toner a this way, when evaluation it does printing characteristic, residual image which parallels to the image pattern is easy occurring you understood.

It is something which derives in textural contamination where this with device which possesses cleaning unit, with [kuriinaresu] image formation method, compilation makes also the filming substance which originates in extremely little toner gradually on the photosensitive material vis-a-vis being able to remove various substance with rubber blade and the brush roller, parallels to image pattern occurring.

[0015]

Result of various examination, as for these phenomenon, it understood that low-molecular-weight component of resin operates, in order to prevent these residual image phenomenon, the molecular weight being important for ratio of resin of 539 or less to make 3.0 weight % or less, was ascertained.

[0016]

When using low temperature fixing toner making use of namely, [kuriinaresu] image formation method, as for the peak value of molecular weight distribution of resin which is used although necessity to lower it is, it is possible low-molecular-weight component which usually, increases to be necessary to decrease consciously.

On one hand, making use of same resin concerning additive, the one where additive is many it was observed that to tendency where residual image phenomenon is little it is.

As for this, additive particle (Below, there is additive simply.) is presumed, resin in photosensitive material and the toner for sake of fact that direct contact it does is obstructed.

[0017]

It is desirable, for amount of additive to be 0.8 parts by weight or more at time of the this, vis-a-vis toner 100 parts by weight if they are 1.0 parts by weight or more, furthermore is desirable.

As additive, for example silica fine particle, aliphatic acid metal salt (zinc stearate, stearic acid aluminum etc), metal oxide (titanium dioxide, aluminum oxide, tin oxide, antimony oxide etc), it is possible to contain fluoropolymer etc.



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□□□□□□□□□□HDK H 2000□HDK H  
2000/4□HDK H 2050EP□HVK21(□□□□□□□  
□)□R972□R974□RX200□RY200□R202□R805□  
R812(□□□□□□□□)□□□□

[0018]

□□□□□□□□□□□□□□P-25(□□□□□□□)  
□ STT-30 □ STT-65C-S( □ □ □ □ □ □ □ ) □  
TAF-140(□□□□□□□)□MT-150W□MT-500B□  
MT-600B(□□□□□)□□□□□

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□ □ □ MT-100S □ MT-100T □ MT150A □  
MT150AFM( □ □ □ □ □ ) □ STT-30A □  
STT-65S-S( □ □ □ □ □ □ □ ) □ TAF-500T □  
TAF-1500T(□□□□□□□□)□MT-100S□  
MT-100T(□□□□□)□IT-S(□□□□)□□□□□

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[0019]

□ □ □ □ □ □ □ □ □ □ GPC(gel permeation  
chromatography)□□□□□□□□□□□□□□

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□□□:GPC-150C(□□□□□□□□)

□□□□:KF801~807(□□□□□□□□□□)□□□:40  
deg C

□□□:THF(□□□□□□□□□□)

□□□:1.0ml/□

□□□:□□ 0.05~0.6%□□□□ 0.1ml □□

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Especially, silica, titania, alumina fine particle which hydrophobicizing is done is ideal.

As silica fine particle, HDK H 2000, HDK H 2000/4, HDK H 2050 European Patent, HVK21 (Or more Clariant) and there is a R972, R974, RX200, RY200, R202, R805, R812 (Or more Nippon Aerosil Co. Ltd. (DB 69-070-2188)).

[0018]

In addition, P-25 (Nippon Aerosil Co. Ltd. (DB 69-070-2188)) and STT-30, STT-65C-S (Or more Titan Kogyo Kabushiki Kaisha (DB 69-056-4729)), TAF-140 (Fuji Titanium Industry Co., Ltd.), there is a MT-150W, MT-500B, MT-600B (Or more Tayca Corporation (DB 69-059-9394)) etc as titania fine particle.

Especially it can use crystalline things such as and non crystalline ones the anatase and rutile form as titanium dioxide fine particle which hydrophobic treatment is done, T-805 (Nippon Aerosil Co. Ltd. (DB 69-070-2188)) and as rutile form, MT-100S, MT-100T, MT 150A, MT 150AFM (Or more Tayca Corporation (DB 69-059-9394)) and STT-30A, STT-65S-S (Or more Titan Kogyo Kabushiki Kaisha (DB 69-056-4729)), TAF-500T, TAF-1500T (Or more Fuji Titanium Industry Co., Ltd.), the MT-100S, MT-100T (Or more Tayca Corporation (DB 69-059-9394)), a IT-S (Ishihara Sangyo K.K. (DB 69-428-8788)) etc there is.

In order to obtain silica fine particle and titania fine particle, alumina fine particle which hydrophobic treatment are done, treating hydrophilic fine particle with methyl trimethoxysilane, and methyl triethoxysilane, octyl trimethoxysilane or other silane coupling agent it can acquire.

In addition, aliphatic acid metal salt (zinc stearate, aluminum stearate etc), metal oxide (alumina, tin oxide, antimony oxide etc), it is possible to contain the fluoropolymer etc together as additive.

[0019]

To seek with GPC (gel permeation chromatography) it is possible molecular weight distribution of toner.

Regarding to this invention, it measured with condition below.

\* sample compilation: Soxhlet extractor

\* device: GPC-150C (Waters Co. make)

\* column: KF801~807 (Shodex supplied) \* temperature: 40 deg C

\* solvent: THF (tetrahydrofuran)

\* flow rate: 1.0ml per minute

\* specimen of specimen: concentration 0.05~0.6% 0.1 ml fills

Using molecular weight correction curve which was drawn up



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[illegible]

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[0022]

In addition, aliphatic dicarboxylic acid and its derivative (maleic acid, fumaric acid, succinic acid, adipic acid, sebacic acid, malonic acid, azelaic acid, mesaconic acid, citraconic acid, glutaconic acid, octyl succinic acid, decyl succinic acid, dodecyl succinic acid, tetradecyl succinic acid, hexadecyl succinic acid, octadecyl succinic acid, iso octadecyl succinic acid, hexenyl succinic acid, octenyl succinic acid, decenyl succinic acid, dodecenyl succinic acid, tetra propenyl succinic acid, tetradecenyl succinic acid, hexadecenyl succinic acid, iso octadecenyl succinic acid, octadecenyl succinic acid, nonenyl succinic acid etc) and alicyclic dicarboxylic acid (cyclohexane dicarboxylic acid, [mechirumejikku] acid etc), aromatic dicarboxylic acid (phthalic acid, isophthalic acid, terephthalic acid, toluene dicarboxylic acid, naphthalenedicarboxylic acid etc) and you can list anhydride of these divalent carboxylic acid and lower alkyl (methyl, butyl etc) ester as divalent carboxylic acid.

Especially, terephthalic acid and isophthalic acid being useful, terephthalic acid is an effect in rise of glass transition temperature ( $T_g$ ), as for isophthalic acid is an effect which raises reactivity.

[0023]

Regarding to this invention, making use of polybasic carboxylic acid component and polyhydric alcohol component of the trivalent or greater it is good.

As polybasic carboxylic acid, there is a trimellitic acid, pyromellitic acid, 1, 2, 4- cyclohexane tricarboxylic acid, 2, 5, 7-naphthalene tricarboxylic acid, 1, 2, 4- naphthalene tricarboxylic acid, 1, 2, 5-hexane tricarboxylic acid, 1, 2, 7, 8-octane tetracarboxylic acid and these acid anhydride.

In addition, you can list sorbitol , 1, 2, 3, 6-hexane tetra roll , 1, 4- sorbitan , pentaerythritol , dipentaerythritol , tri pentaerythritol , sucrose , 1,2,4-butanetriol , 1, 2, 5-penta triol , glycerol , 2- methyl propane triol , 2- methyl -1,2,4-butanetriol , trimethylol ethane , trimethylolpropane , 1, 3, 5-trihydroxy methylbenzene etc as polyhydric alcohol , alone or mixing, you can use these.

polyfunctional group monomer a this way as there is an effect which raises Tg of resin , to grant agglutination property to

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resin , because there is an effect which raises offset resistance ,  
 as for introduced amount adjusting to fixing temperature and  
 copy speed of copier , it is desirable in polymer to try to  
 be included in range of 20 mole % or less .

[0024]

Furthermore regarding to this invention, making use of  
 monovalent carboxylic acid component and the monohydric  
 alcohol component it is good.

As univalent carboxylic acid component , you can list  
 component which derives in for example benzoic acid , 4-  
 t-butyl benzoic acid , p-hydroxybenzoic acid .

You can list to monohydric alcohol component , component  
 which derives in for example benzyl alcohol , 4- t-butyl  
 -benzyl alcohol , dodecanol , single end-capped polyethylene  
 glycol .

Because reaction to be considerable inhibition it does these  
 compound , it is desirable in resin to be included in range of 10  
 mole % or less , according to high and low of degree of  
 polymerization of resin which is made the goal .

[0025]

resin of this invention inserts above-mentioned compound in  
 reaction vessel , can produce esterification reaction or  
 transesterification reaction by elevated temperature doing.

At time of this , esterification catalyst or ester exchange  
 catalyst which is used with according to need , sulfuric acid ,  
 titanium butoxide , dibutyl tin oxide , manganese acetate or  
 other conventional esterification reaction or transesterification  
 reaction can be used.

Next, following to conventional method , while removing  
 water or alcohol which it occurs with reaction, furthermore  
 under vacuum , distilling removing the diol component it is  
 desirable to polymerize.

In addition, usually, polymerization catalyst , for example  
 titanium butoxide , dibutyl tin oxide , tin acetate , zinc acetate ,  
 tin disulfide , antimony trioxide , germanium dioxide etc of  
 public knowledge can be used at the time of polymerization.

As for Tg of polyester resin which it acquires, it is desirable to  
 be 55 - 75 deg C, it is more desirable to be 60 - 70 deg C.

[0026]

As colorant ,

all be able to use dye and pigment of public knowledge ,  
 for example

carbon black ,

[illegible]

Be able to use those of public knowledge as antistatic agent , for example nigrosine dye , triphenylmethane dye , chromium-containing metal complex dye , molybdic acid chelate pigment , rhodamine dye , alkoxy amine , quaternary ammonium salt (fluorine modification quaternary ammonium salt is included. ), is fact that unit of alkyl amide , phosphorus or unit or the compound , fluorine type activity agent , salicylic acid metal salt of compound , tungsten and metal salt etc of salicylic acid derivative are listed.

amount used of charge regulator in this invention, types, according to need of binder resin being something which is decided with toner production method which includes presence or absence, dispersing method of additive which is used, is not something which is decided in evenness. Vis-a-vis preferably, binder resin 100 parts by weight, it is used in range of 0.1 - 10 parts by weight, it is range of preferably, 2~5 parts by weight.

0.1 Under parts by weight, negative charging of toner becomes insufficient, it is not a practical.

When it exceeds 10 parts by weight, electrostatic property of toner is too large, for increasing electrostatic suction force of carrier, causes flow property decrease of the developer and decrease of image density.

In addition, it is possible to jointly use with antistatic agent of the according to need, plural.

[0028]

In order to grant mold release property to toner making use of mold release it is good to this invention.

softening point of mold release which is used 70 - 100 deg C is desirable.

When softening point when it is low in comparison with 70 deg C storage stability to deteriorate, conversely, softening point is higher than 100 deg C, because it becomes scanty in mold release effect with low temperature, it is not desirable.

As mold release, you can list those copolymer or other synthetic wax, candelilla wax, carnauba wax, rice wax, Japan wax, jojoba wax or other plant wax, beeswax, lanolin, whale wax or other animal wax, montan wax and ozocerite or other mineral wax, hydrogenated castor oil, hydroxystearic acid, fatty acid amide, phenol fatty acid ester or other lipid wax etc of polyethylene or polypropylene, of low-molecular-weight.

When you look at wax from point of chemical structure, wax etc of wax, amide type of wax, ester type of hydrocarbon it is known, but when wax of ester type, evaluation does from storage property and image quality, fixing temperature width etc, they are preferred ones.

As for quantity of mold release, 1 - 6 parts by weight are ideal vis-a-vis the toner entirety.

When it is more than 6 parts by weight, problem occurs in storage stability etc, when it is less than 1 part by weight, sufficient mold release effect is not acquired.

[0029]

Regarding to this invention, image developing it does developer and forming and latent electrostatic image with toner

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alone, it is possible to develop with so-called one component developing method and, mixing toner and carrier, image developing is done it is possible to develop latent electrostatic image with two components developing method which making use of two components developer which becomes.

iron powder, ferrite, glass beads etc, those which are known until recently can be used as the carrier which is used with two components developing method.

Furthermore, these carrier may be something which sheath is done with resin.

In case of this, resin which is used is poly carbon fluoride, polyvinyl chloride, poly vinylidene chloride, phenolic resin, polyvinyl acetal, silicone resin etc.

As for mixture fraction of toner and carrier, toner 0.5~6.0 parts by weight extent is suitable whichever vis-a-vis carrier 100 parts by weight.

Next, you explain concerning image formation method of this invention, on basis of figure.

[0030]

As for Figure 1, cross section of developing device which is used for image formation method of this invention is shown.

As for 1 as for photoreceptor drum, 3 as latent image grip developing device (Here one component nonmagnetic developing device was illustrated, but regarding to this invention, with one component magnetism development and it is good with two components development), as for 4 with the developing roller which is a toner carrier which is mounted in above-mentioned developing device 3, through toner thin layer which is borne in surface, it contacts surface of photoreceptor drum 1, is turning with perimeter speed of 1.2 - 4.0 times extent of the photosensitive material 1.

In addition, as for 5 as for copying charging device, 8 as for deelectrification lamp, 9 the charging device (scorotron charging device), as for 10 light beam (laser beam), as for 11 it is a homogenization brush in the Figure 1.

As for 12 as for direct current power source, 13 which gives potential to homogenization brush 11 as for toner supply roller, 14 which supplies toner 2 to toner carrier 4 toner carrier four planes oppositely touching bitterly, as for thin layer blade, 15 which is a toner layer thickness restricting member which is borne it is a agitator.

[0031]

When this invention, this way, has transfer step which copies developing step and toner image which latent image image developing are done on support making use of latent image formation step. toner which at least forms latent image in latent image grip surface, after copying toner which remains on latent

image grip , image developing does latent image with developing step , regarding to image formation method which recovers simultaneously inside developing device , It is a image formation method which designates that toner for above-mentioned static electric charge development is used as feature.

[0032]

**[Working Example(s)]**

Below, listing Working Example, furthermore you explain this invention in detail, but with these Working Example, this invention is not something which is limited.

Furthermore, "part" certain is parts by weight.

[0033]

[illegible]

With Henschel mixer after mixing, melt mixing it did blend of the above-mentioned formulation with twin shaft kneader, after cooling, coarse pulverization did with pulverizer.

coarse pulverization item with I type jet mill classification was done with the fine pulverization , classifier 132MPa .

Furthermore, mixing with mixer vis-a-vis classified product 100 parts , hydrophobic silica fine particle of 0.5 part (Clariant ;HDK2000H ) with including hydrophobic titanium dioxide fine particle (Titan Kogyo Kabushiki Kaisha (DB 69-056-4729 ); STT30A ) of 0.4 part , it acquired the toner A.



[0034]

### Working Example 2 (toner production Example 2)

Mixing to classified product 100 parts which is acquired with Working Example 1, with mixer hydrophobic silica fine particle of 0.3 part (Clariant ;HDK2000H ) with including hydrophobic titanium dioxide fine particle (Titan Kogyo Kabushiki Kaisha (DB 69-056-4729 ) ; STT30A ) of 0.2 part , itacquired toner B.

[0035]

Working Example 3, 4 (toner production example 3, 4 )			
polyester resin 2			100 sections
EO attaching of PO adduct *bisphenol A of alcohol component ;bisphenol A			
Adding ones, acid component ;terephthalic acid *fumaric acid *trimellitic acid anhydride , 0, tg; 60 *) carnauba wax (ester wax , melting point : approximately 82 * ) carbon black (Mitsubishi Chemical Corporation (DB 69-056-6740 ) ; M A8)			Mw ;9520 5 part 10 part
[sarichiru ] jp8 jp11 acid iron derivative Lee Orient Chemical Industries Ltd. (DB 69-059-7216 ) * Bontron	11		2.5 Section

With Henschel mixer after mixing, melt mixing it did blend of the above-mentioned formulation with twin shaft kneader, after cooling, coarse pulverization did with pulverizer.

coarse pulverization item with I type jet mill classification was done with the fine pulverization , classifier 132MPa .

Furthermore, mixing with mixer vis-a-vis classified product 100 parts, hydrophobic silica fine particle of 0.5 part (Clariant; HDK2000H) with including hydrophobic titanium dioxide fine particle (Titan Kogyo Kabushiki Kaisha (DB 69-056-4729); STT30A) of 0.4 part, mixing with the mixer toner C, vis-a-vis classified product 100 parts, hydrophobic silica fine particle of 0.3 part (Clariant; HDK2000H) with including hydrophobic titanium dioxide fine particle (Titan Kogyo Kabushiki Kaisha (DB 69-056-4729); STT30A) of 0.2 part, it acquired toner D.

[0036]

[0036] (Example 5, 6)

Example 1, polyester resin 1, polyester resin 3 (EOadduct, acid component; terephthalic acid \* fumaric acid \* trimellitic acid anhydride, Mw; 188000, Tg; 58 deg C) of POadduct \* bisphenol A of alcohol component; bisphenol A), was replaced to polyester resin 4 (EOadduct, acid component; terephthalic acid \* fumaric acid \* trimellitic acid anhydride, Mw; 260000, Tg; 64 deg C) of POadduct \* bisphenol A of alcohol component; bisphenol A), toner E and toner F were acquired.

Melting each toner in THF, you applied dissolved fraction on GPC and measured molecular weight distribution.

Result is shown in Table 1, Table 2 and Figure 2.

[0037]

[Table 1]

[0036]

Working Example 5, 6 (toner production Example 5, 6)

In Working Example 1, polyester resin 1, polyester resin 3 (EOadduct, acid component; terephthalic acid \* fumaric acid \* trimellitic acid anhydride, Mw; 188000, Tg; 58 deg C) of POadduct \* bisphenol A of alcohol component; bisphenol A), was replaced to polyester resin 4 (EOadduct, acid component; terephthalic acid \* fumaric acid \* trimellitic acid anhydride, Mw; 260000, Tg; 64 deg C) of POadduct \* bisphenol A of alcohol component; bisphenol A), toner E and toner F were acquired.

Melting each toner in THF, you applied dissolved fraction on GPC and measured molecular weight distribution.

Result is shown in Table 1, Table 2 and Figure 2.

[0037]

[Table 1]

LOG(分子量)	トナーA、B	トナーC、D	トナーE	トナーF
1.279	0.07	0.04	0.05	0.05
1.431	0.03	0.02	0.04	0.02
1.580	0.03	0.03	0.04	0.03
1.724	0.03	0.03	0.05	0.03
1.863	0.04	0.06	0.08	0.03
1.996	0.04	0.08	0.12	0.03
2.127	0.05	0.10	0.15	0.03
2.253	0.09	0.12	0.32	0.04
2.378	0.15	0.27	0.68	0.05
2.496	0.41	0.63	1.17	0.05
2.617	0.69	1.31	1.39	0.09
2.732	1.22	1.27	1.33	0.15
2.844	1.31	1.58	1.73	0.41
2.953	1.74	2.39	2.48	0.69
3.060	2.83	4.07	3.48	1.25
3.185	3.89	5.41	4.87	1.31
3.266	5.02	6.89	5.81	1.74
3.366	6.01	7.86	6.53	2.83
3.464	6.89	8.54	7.41	3.92
3.559	7.48	8.75	7.68	5.02
3.652	7.65	8.63	7.72	6.01
3.744	7.54	8.19	7.44	6.81
3.833	7.37	7.33	6.77	7.44
3.922	6.76	6.07	5.79	7.71
4.008	5.79	4.66	4.85	7.57
4.093	5.02	3.35	4.04	7.13
4.177	4.09	2.29	3.28	6.57
4.259	3.30	1.55	2.48	5.79
4.341	2.48	1.08	1.88	5.02
4.421	2.03	0.82	1.41	4.11
4.500	1.42	0.67	1.10	3.32
4.579	1.10	0.59	0.77	2.48
4.657	0.82	0.53	0.68	2.05
4.734	0.63	0.49	0.51	1.42
4.811	0.51	0.44	0.45	1.10
4.887	0.45	0.39	0.40	0.83
4.963	0.40	0.34	0.35	0.62
5.039	0.35	0.29	0.31	0.51
5.114	0.31	0.26	0.28	0.45
5.190	0.28	0.22	0.26	0.40
5.266	0.26	0.19	0.24	0.35
5.342	0.24	0.16	0.22	0.31
5.419	0.22	0.14	0.20	0.28
5.495	0.20	0.13	0.18	0.26
5.573	0.18	0.12	0.17	0.24
5.651	0.17	0.11	0.17	0.22
5.730	0.16	0.10	0.17	0.20
5.810	0.16	0.10	0.16	0.18
5.890	0.15	0.10	0.16	0.17
5.972	0.15	0.10	0.15	0.17
6.055	0.14	0.10	0.15	0.17
6.139	0.14	0.09	0.15	0.16
6.225	0.14	0.09	0.15	0.16
6.312	0.13	0.08	0.15	0.15
6.401	0.12	0.08	0.15	0.15
6.491	0.12	0.08	0.15	0.16
6.583	0.11	0.08	0.15	0.17
6.678	0.10	0.08	0.14	0.18
6.774	0.09	0.08	0.13	0.19
6.872	0.09	0.08	0.12	0.19
6.973	0.09	0.07	0.11	0.18
7.076	0.09	0.06	0.09	0.16
7.181	0.09	0.05	0.08	0.14
7.289	0.09	0.04	0.08	0.11
7.400	0.09	0.03	0.07	0.09
7.513	0.07	0.02	0.06	0.07
7.629	0.06	0.02	0.04	0.06
7.748	0.04	0.01	0.04	0.05

□0038□

[0038]

□□2□

[Table 2]

	実施例			
	1, 2	3, 4	5	6
	トナー A, B	トナー C, D	トナー E	トナー F
分子量 539 以下の重量%	2. 8 5	3. 9 5	5. 4 2	0. 6 0
Mp	4 4 9 0	4 4 9 0	4 4 9 0	8 3 4 8

□0039□

[0039]

□ 1 □□□□□□□□□□□□□□□□□□□□□□□□ A~F □  
□□□□□

toner A~F evaluation was done making use of experiment machine which possesses developing part which is shown in Figure 1.

□□□□□□□ 400 □□□/□□□□□□□□□□□□□□  
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□□400 □□□□□□□□□□ A4 □□□□□□ 1000 □  
□□□□□□□1×1 □□□□□□□□□□ 5 □□□□□  
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Here, it did experiment with optical system of 400 dots/inch.

First, you inserted toner in experiment machine, after leaving in environment which does experiment, vertical line of 400 dot 1000printing, after that, 5 printing halftone image of 1 X 1 consecutively with A4size, you did image evaluation.

□□□□3□□□□

Result is shown in Table 3.

□0040□

[0040]

□□3□

[Table 3]

ネガ残像評価結果

トナー種	常温常湿でのテスト	10℃15%RHでのテスト
A	異常画像なし	異常画像なし
B	異常画像なし	極薄いネガ残像が1/5枚発生
C	異常画像なし	異常画像なし
D	異常画像なし	極薄いネガ残像が2/5枚発生
E	薄いネガ残像が3/5枚発生	明瞭なネガ残像が5/5枚発生
F	異常画像なし	異常画像なし

□0041□

[0041]

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While next, heater temperature changing ipsio NX700 (strain ) Ricoh Co. Ltd. (DB 69-054-9118 ) make) of making use fixing property of each toner, evaluation it did by taking image.

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It pasted mending tape (3 M supplied ) in image of after fixation, after applying the fixed pressure, it peeled slowly, it measured image density of front and back due to MacBeth densitometer.

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□)□ 0.8 □□□□□□□□□□□□□□□□□□□□□□□□

evaluation it did fixing property, with minimum fixing roller temperature where (After tape depositing before image density /tape depositing image density ) maintains 0.8.

□□□□4□□□□

Result is shown in Table 4.

□0042□

[0042]

□□4□

[Table 4]

## 定着性評価結果

トナー種	定着下限ローラー温度
A	130℃
B	125℃
C	135℃
D	130℃
E	125℃
F	145℃

□0043□

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3

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[0043]

## [Effects of the Invention]

According to this invention, while maintaining low temperature fixing behavior, there is not anabolition job of residual toner, when adopting useful [kuriinaresu] image formation method for the environmental contamination prevention, it evades residual image decrease which it occurs, fact that the image formation method which uses electrostatic imaging toner and this toner which at same time canassure cost reduction is offered, contributes to electrophotograph image formation field quite is largeones.

## [Brief Explanation of the Drawing(s)]

## [Figure 1]

It is a sectional view which shows essential constitution example of [kuriinaresu] recording equipment which isused for image formation method of this invention.

## [Figure 2]

It is a figure which shows molecular weight distribution of toner of this invention.

## [Explanation of Symbols in Drawings]

1

latent image grip (photosensitive material)

10

light beam

11

toner homogenization brush

2

toner

2'

residual toner

3

developing device

4

□□□□□□(□□□□□□)

5

□□□□□□

6

□□□□□

9

□□□□

**Drawings**

□□□□

4

toner carrier (developing roller )

5

Copying charging device

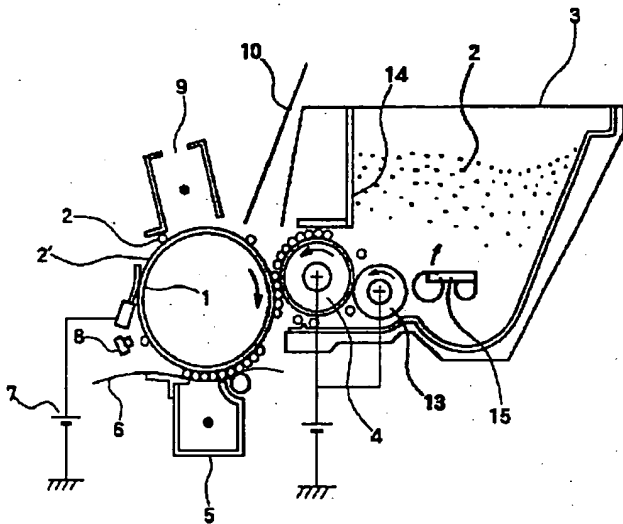
6

Image support

9

charging device

[Figure 1]



□□□□

[Figure 2]

BEST AVAILABLE COPY